Chapter 2: Viewshed Analysis

Human awareness of historical, cultural and environmental resources as revealed in America's landscape is ever increasing. Our national parks and parkways are charged with preservation of these valuable resources for the pleasure of the visitor. The Foothills Parkway is no exception to this charge. Originally perceived as a "scenic parkway," the Foothills Parkway would allow the visitor to experience the historical, cultural and environmental resources available in Great Smoky Mountains National Park.

Driving for pleasure, sightseeing, hiking and biking are some of the popular recreational activities that may attract visitors to the Foothills Parkway. The enjoyment that visitors receive from these recreational activities depends largely on how the visitor perceives the visual surroundings. A recent study commissioned by the National Park Service entitled *Scientific Monograph Series No. 18* (SMS 18), "Visual Preferences of Travelers Along the Blue Ridge Parkway" reports that many of the benefits received by visitors from engaging in recreational activities are directly related to how the visual surroundings are viewed, managed and presented to the visitors (Poe et al., 1988; Hammitt, 1980; Mercer, 1975; Moeller et al., 1974).

Consistent with the 1944 Congressional action mandating the Foothills Parkway, one of the determining factors as to whether the remaining sections (B, C and D) should be built is the availability of views or viewsheds. Consequently, this study includes an analysis of the availability and appropriateness of viewsheds along the Foothills Parkway.

2.1 Viewshed Defined

A viewshed is defined as the geographic area visible to an observer from a specific location. Ridges, valleys and other topographic features bound viewsheds along the Foothills Parkway. The viewshed quality directly affects the level of pleasure a visitor may experience. Factors such as season, time of day, vegetation, commercial development and residential development affect the viewshed quality.

2.2 Viewshed Analysis Methodology

An analysis of each individual viewshed provides a method of quantifying the viewshed quality. The viewshed analysis methodology includes three primary steps. The first step is to identify available views along the Foothills Parkway. The second step allows an analysis of each view to determine specific viewshed attributes. The final step is to quantify the viewshed quality.

Quantifying allows assignment of a numerical value to each individual viewshed for comparison and ranking purposes. The results of the viewshed analysis provide an indication of the level of pleasure a visitor may experience.

The combination of three-dimensional (3D) computer rendering techniques and current (2001) satellite imagery allows a thorough analysis of each individual viewshed. A detailed description of each step of the viewshed analysis follows:

Step 1 – Identify Available Views

Since Sections B, C and D of the Foothills Parkway are not constructed, it is difficult to accurately identify the locations of available "appropriate views" using traditional methods. Walking and viewing the incomplete sections of the Foothills Parkway provides an indication of where appropriate views may be present; however, vertical and horizontal alignment constraints of the proposed parkway may limit or even prohibit the view.

To overcome the difficulty of accurately determining the location of appropriate views, a 3D computer model was created to depict the topography of the area. Geographic Information System (GIS) data was obtained from the National Park Service, which allowed creation of a 3D computer model of the Park including the Foothills Parkway corridor and areas in between. Actual design data for Sections B and D provided by the FHWA and for Section C prepared by Wilbur Smith Associates was used to develop a 3D computer model. Merging the 3D computer models of the Park and the Foothills Parkway together provided an "as-built" 3D computer model of the proposed Foothills Parkway corridor and surrounding area.

Viewing the proposed construction cross sections of the Foothills Parkway quickly and accurately identified available view locations. A verification of each view location was obtained by viewing the 3D computer model. Figure 5 provides examples of the 3D computer model used to determine and verify potential view locations.

Step 2 – Determine Viewshed Attributes

Measurable viewshed attributes having a direct impact on viewshed quality include viewshed area inside and outside the Park, development density within the viewshed and distance from the observer to the nearest "target" view within the Park.

The viewshed area affects quality since the viewshed area outside the Park is subject to development or other negative disturbances while the viewshed area inside the Park is regulated by the NPS. With the 3D computer model and other proprietary computer software, visualization techniques were employed to accurately identify the viewshed areas. From the viewshed observation point, a circumferential scan identified visible surfaces within the 3D model. As expected, ridges, valleys and other topographic features bound these visible surfaces. Areas were obtained by planar measurement inside and outside the Park. Figure 6 provides a sample viewshed determined by the

circumferential scan of the 3D-computer model.

The development density within the viewshed affects how the observer will perceive the viewshed quality. Overlaying the satellite imagery onto the viewshed area reveals the number of buildings within the viewshed area and the corresponding development density. Figure 7 provides a sample viewshed with development shown from the satellite imagery.

The distance from the observer to the target view is an important attribute since air quality, time of day and season affect the observer's ability to see. As shown in Figure 8, this linear measurement is readily obtained directly from the 3D-computer model.

Step 3 – Quantify Viewshed Quality

Quantifying the viewshed quality allows assessment of the appropriateness of available views toward meeting the 1944 Congressional mandate. *"Scientific Monograph Series Number 18"* (SMS 18), published by the National Park Service in 1988, allows the quantification of viewshed quality by providing a method of ranking viewsheds based on human visual preferences. The primary goal of SMS 18 was to identify landscape themes most preferred for viewing by the visitor.

The SMS 18 study was conducted from vista scenes taken along the completed Blue Ridge Parkway.

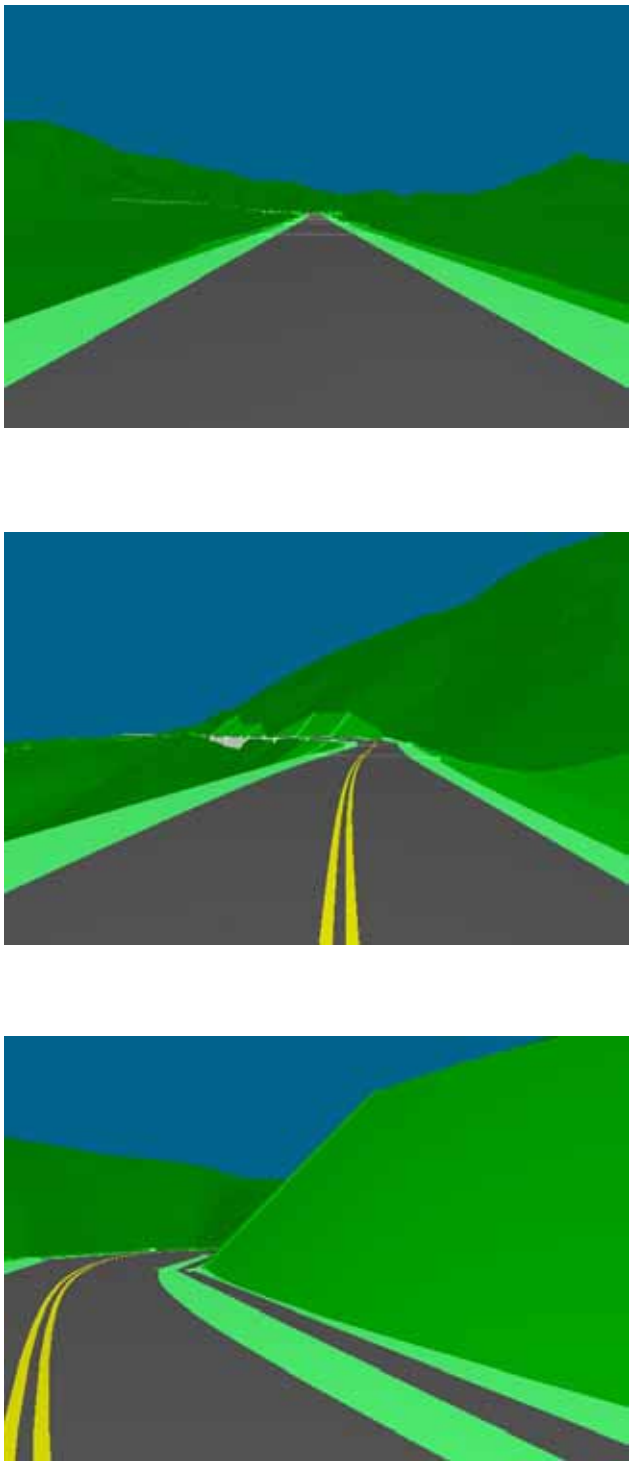


Figure 5: Sample 3D Model Views

Figure 6. Sample of a Viewshed Analysis

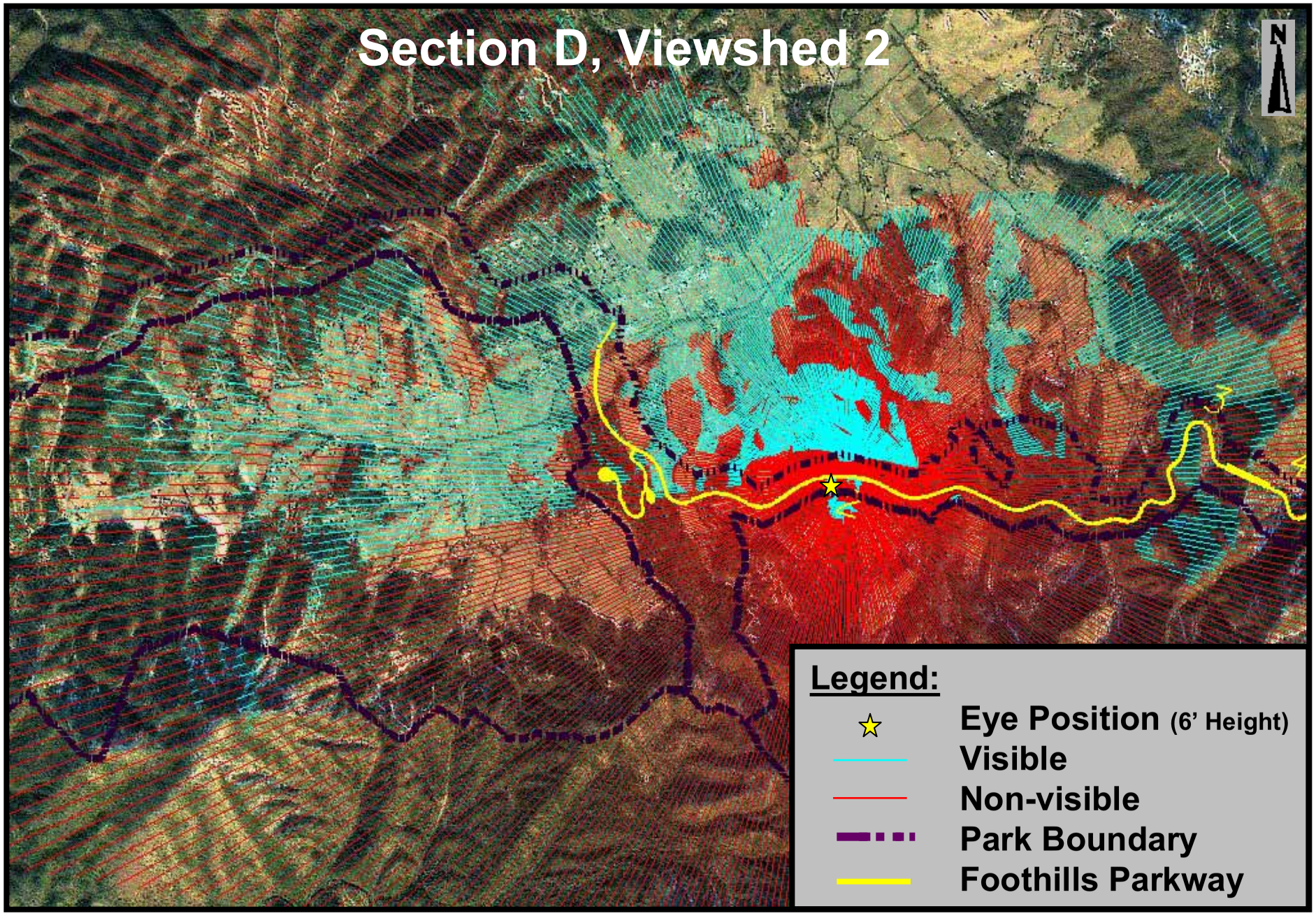


Figure 7. Sample Development Density

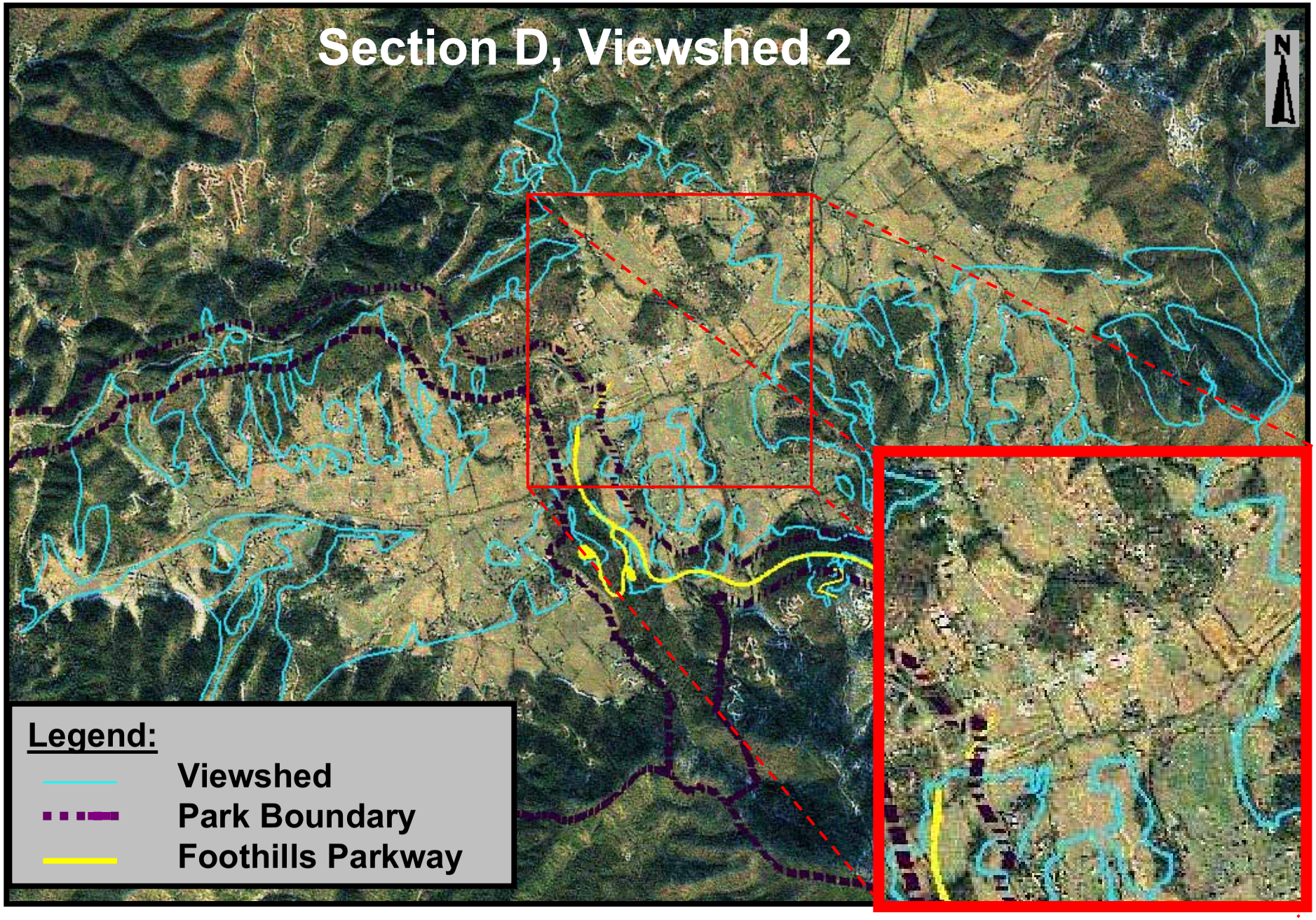
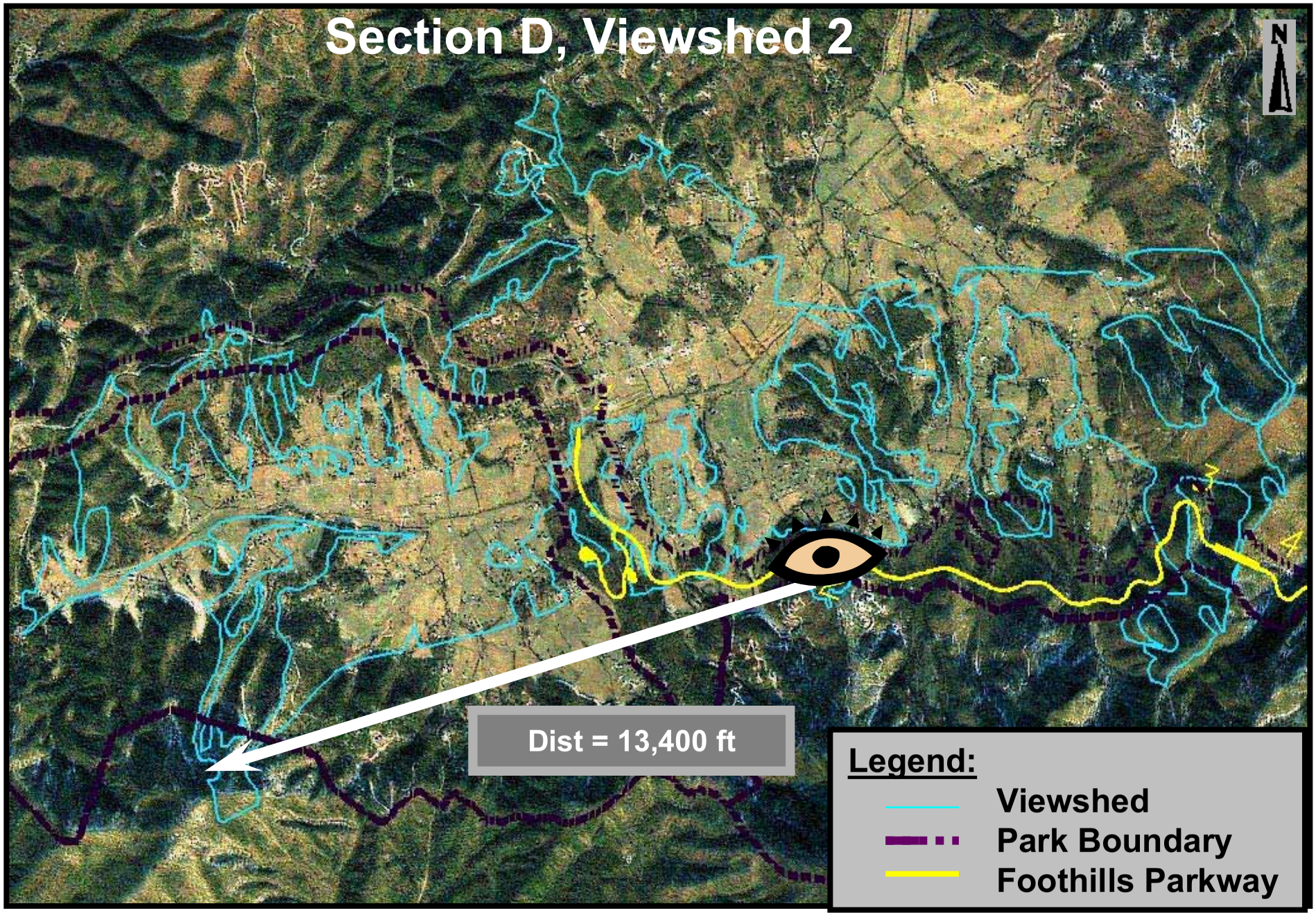


Figure 8. Sample Viewshed Distance



The visitor ranked photographs of 96 vista scenes from a value of 1 (least preferred) to a value of 5 (most preferred) based on his/her own opinion. These individual preference ratings were then averaged to determine a mean numerical value for each vista scene. The photos were analyzed using methods described in SMS 18 to reduce the large data set of photos to small groups of themes that demonstrated a shared commonality of content. For these small groups of common themes, a mean value was determined and used as a basis for interpreting the visual preferences of visitors. Table 1 provides the individual preference value and ranking for each vista dimension with viewshed typology results as reported in SMS 18.

For quantifying the value of viewsheds along the Foothills Parkway, six vista dimensions were adapted from SMS 18 including stream/river, pond/lake, several ridges, pastoral development, one ridge and unmaintained vegetation.

These six vista dimensions are also common themes found along the Foothills Parkway. A comparative examination of actual photographs taken along the Foothills Parkway depicts these six vista dimensions and reveals the range of individual preference values as shown in Figure 9. Potential viewsheds along Foothills Parkway typically contain multiple vista scenes. Each vista scene was reviewed and categorized into one of the six categories providing a corresponding preference value for each vista scene. Two methods were employed to determine the category of each view including 1) review of actual photographs taken in the field and 2) review of computerized images taken in the 3D computer model.

Table 1: Visual Preference of Vistas

Means	Vista Dimensions	Typology
High Preference		
4.61	Stream/River	WATER VISTAS
4.12	Pond/Lake	
3.96	Several-Ridged	MULTI-RIDGED VISTAS
3.75	Rolling Plateau	
3.68	One-Ridged	PASTORAL VISTAS
3.60	Farm Valley	
3.57	Valley Development	
3.46	Ridge and Valley	
3.36	Unmaintained	UNMAINTAINED VISTAS
3.21	Unmaintained	
3.19	One-Ridged	
2.99	Unmaintained	
Low Preference		

*Scientific Monograph Series (SMS) No. 18: "Visual Preferences of Travelers Along the Blue Ridge Parkway"

Unmaintained Vegetation

Score* = 2.99

Mountains with One Ridge

Score* = 3.19

Pastoral Development

Score* = 3.61

Mountains with Several Ridges

Score* = 3.96

Stationary Water

Score* = 4.12

Rapidly Moving Water

Score* =4.61

*** Scientific Monograph Series (SMS) No. 18:**
"Visual Preferences of Travelers Along the Blue Ridge Parkway"

Figure 9: Range of Vista Dimensions

With the first method, actual photographs of vista scenes along the Foothills Parkway were taken at accessible locations known from 3D computer model inspection to provide adequate visitor viewing upon construction completion. The vista scene positions were identified in the 3D computer model. Utilizing Global Positioning System (GPS) methods, the vista scene position was identified in the field. The photographs were then taken in the field at the exact vista scene position. The actual photographs were objectively reviewed to determine the vista scene's vista dimension and corresponding preference value.

The second method for reviewing vista scenes along the Foothills Parkway was employed at non-accessible vista scene positions. Non-accessible vista scenes are locations that are physically difficult to access and/or locations that are dramatically affected by future construction. Locations of this type include areas of extreme cut or fill necessitated by the horizontal and vertical alignment of the proposed Foothills Parkway. Computerized images were taken in the 3D-computer model at the vista scene position. The computerized images and the digital satellite imagery were reviewed to determine the vista scene's vista dimension. The digital satellite imagery provides information not available in the 3D computer model such as locations of ponds, streams, lakes and development pertinent to determining the vista scene's vista dimension and corresponding preference value. Figure 10 provides a computerized image of the 3D computer model and satellite imagery for a typical vista scene found on the Foothills Parkway.

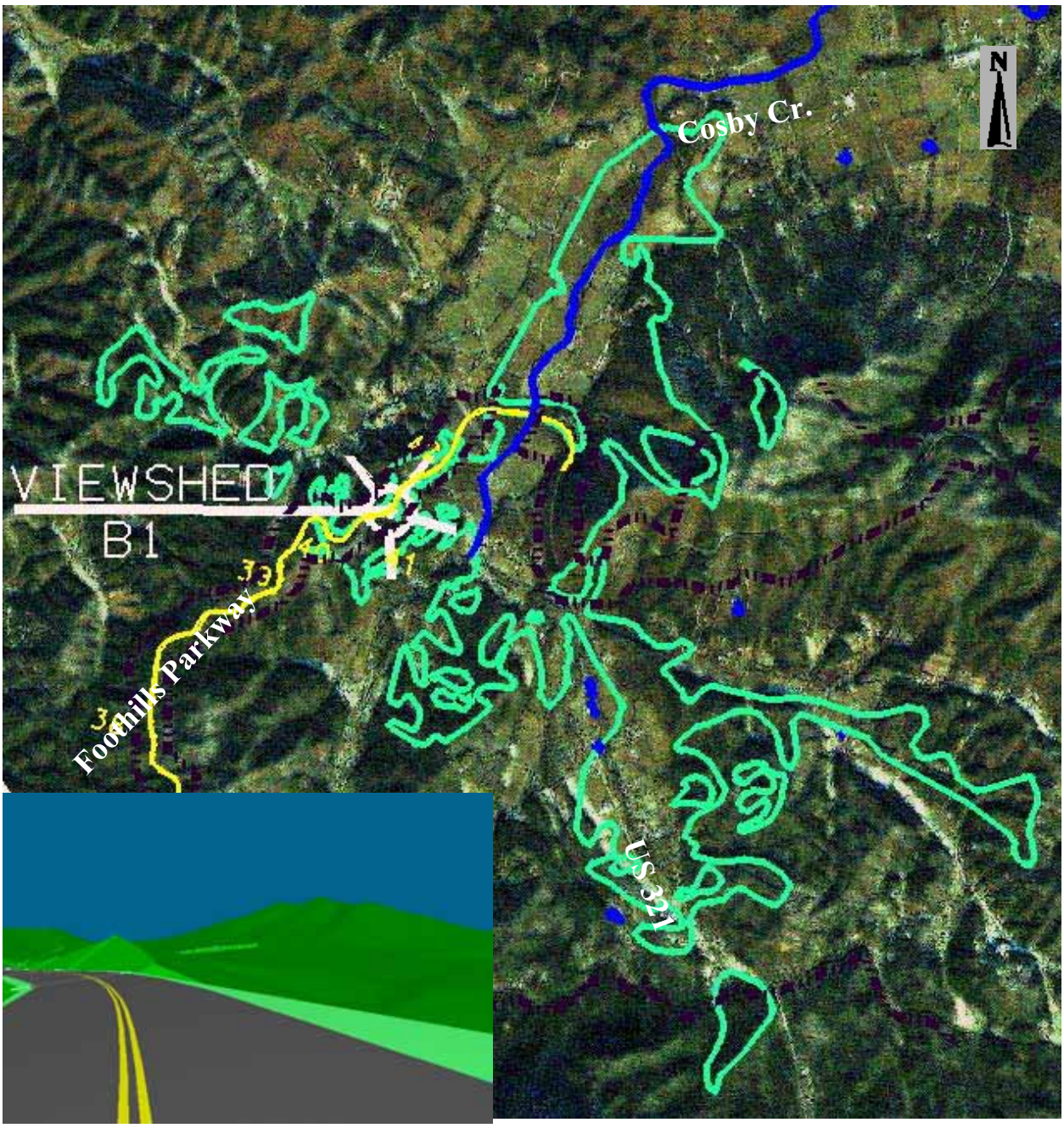
With the preference value for each individual vista scene determined, the preference value for the entire viewshed was calculated by averaging the preference values of each individual vista dimension found in the viewshed. To determine the overall preference value for each of the remaining sections (sectional preference value) of the Foothills Parkway (i.e. Sections B, C and D), the average viewshed preference values were summed for all viewsheds contained in each section. The viewshed preference value provides an indication of quality and level of pleasure experienced by the viewshed visitor at a specified location, while the sectional preference value provides an indication of quality or level of pleasure experienced by the visitor along a section of the Parkway.

2.3 Viewshed Analysis Results

Using the procedures discussed in Step 1 of the Viewshed Analysis Methodology, a total of 43 view locations were identified along the Foothills Parkway including 22 in Section B, 10 in Section C and 11 in Section D. The proposed cross sections utilized to determine the view locations are available in digital format and are contained in the file *xs_fh.dgn* located on the Appendix Compact Disc. The 3D-computer model used to verify the view locations is available at Great Smoky Mountains National Park in digital format (filename *Foothills_3d.dgn).* This file can be viewed using Microstation J and GEOPAK 2000 proprietary software.

Figure 10. Typical Vista Analysis

Section B Viewshed 41 (B1) Station 1784+00, Looking NE



The 43 identified view locations are depicted in Figures 11, 12 and 13 for Sections B, C and D, respectively.

The viewshed attributes for each individual view location were determined using the procedures identified in Step 2 of the Viewshed Analysis Methodology. The viewsheds for each of the 43 view locations were delineated by the circumferential scan of the 3D model at each observation point. Table 2 displays the viewshed attribute results for each of the 43 view locations. The delineated viewsheds are available from Great Smoky Mountains National Park in digital format (filename *fhvs.dgn*). The digital file can be viewed using Microstation J proprietary software.

Viewsheds containing the predominant area inside the Park include Viewshed Numbers 16 through 20, 22 through 25, 27 through 30, 33, 35 through 39 and 42 (20 total viewsheds) and are not subject to private development since the area inside the Park is regulated by the NPS. Viewsheds containing the predominant area outside the Park include Viewshed Numbers 1 through 15, 21, 26, 31, 32, 34, 40, 41 and 43 (23 total viewsheds) and are subject to private development as regulated by local zoning restrictions and terrain. Since the Congressional mandate specifically refers to views of the Park, the analysis considered “Park” and “non-Park” viewshed areas accordingly. Visibility data as recorded by the NPS for GSMNP reveals that the typical summer season visibility, given regional air quality issues, averages about 79,200 feet (15 miles).
The visibility improves during other seasons. Therefore, all viewsheds should have ample visibility of GSMNP. It should be noted that under natural conditions (i.e. no haze or other unnatural air pollutants), the typical summer season visibility averages about 316,800 feet (60 miles) with a 20% annual best days average of about 696,960 feet (132 miles).

The viewshed preference values and sectional preference values were determined using the procedures outlined in Step 3 of the Viewshed Analysis Methodology. Actual photographs taken in the field and computer images taken in the 3D computer model utilized in the preference value determination are available in digital format and contained in the *Model Snap Shot* folder located on the Appendix Compact Disc. The digital file is readily viewed using any *.jpg* format software. An example of a computer generated image is shown in the inset of Figure 10.

Tables 3, 4 and 5 display the viewshed preference value and sectional preference value results for Sections B, C and D, respectively. Tables 6a and 6b provide a summary of the viewshed analysis results. These tables describe the Park viewshed values and separately indicate the total viewshed value, which includes non-Park viewshed attributes.

The methodology used to determine the viewshed preference values reveals that the least preferred vista dimension has a value of 2.99 and the most preferred vista dimension has a preference value of 4.61. The average of all preference values reported in SMS 18 is 3.625. Intuitively, any viewshed with a preference value over the average value can be considered as being above average in quality.

Figure 11. Foothills Parkway Section B

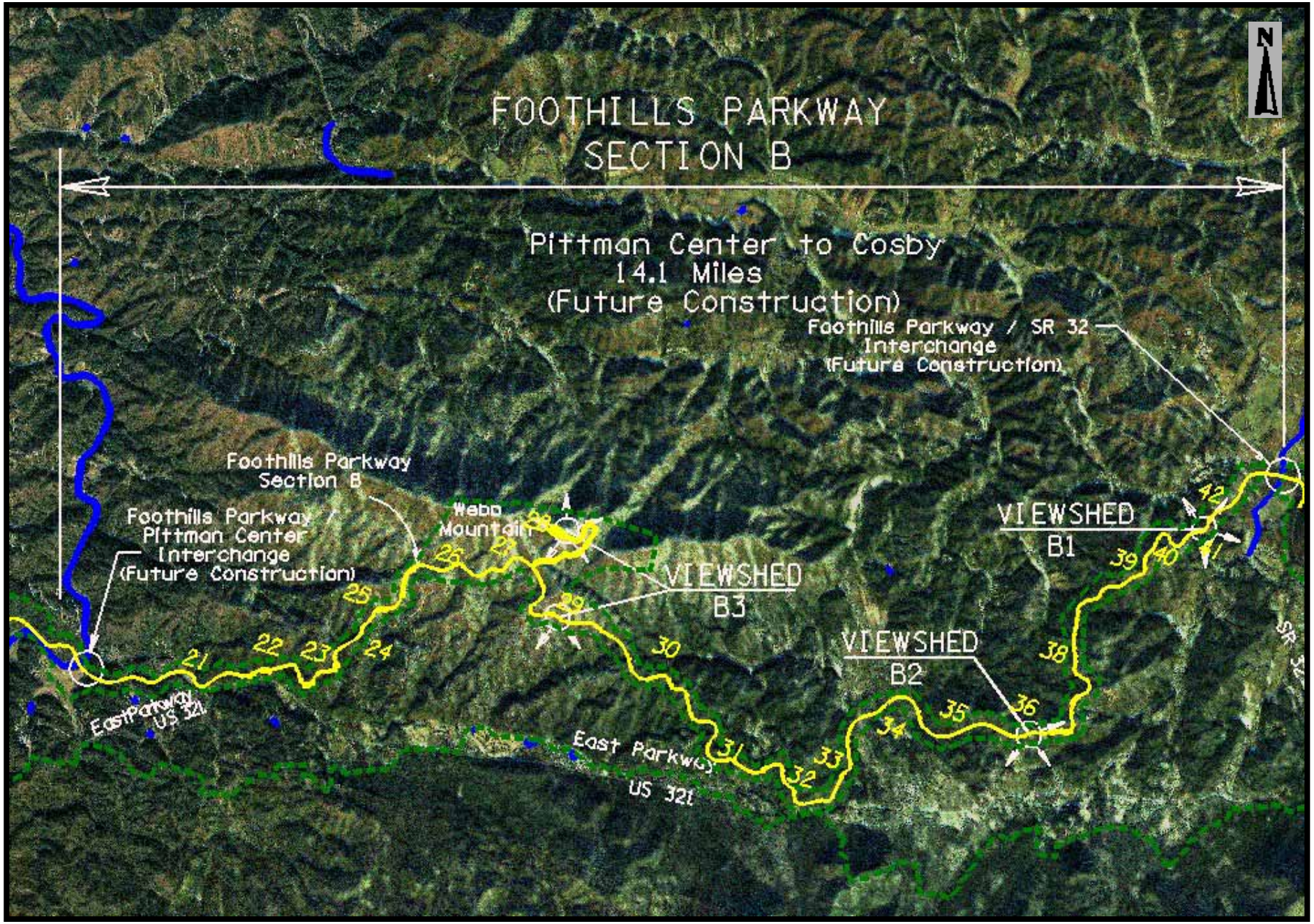


Figure 12. Foothills Parkway Section C

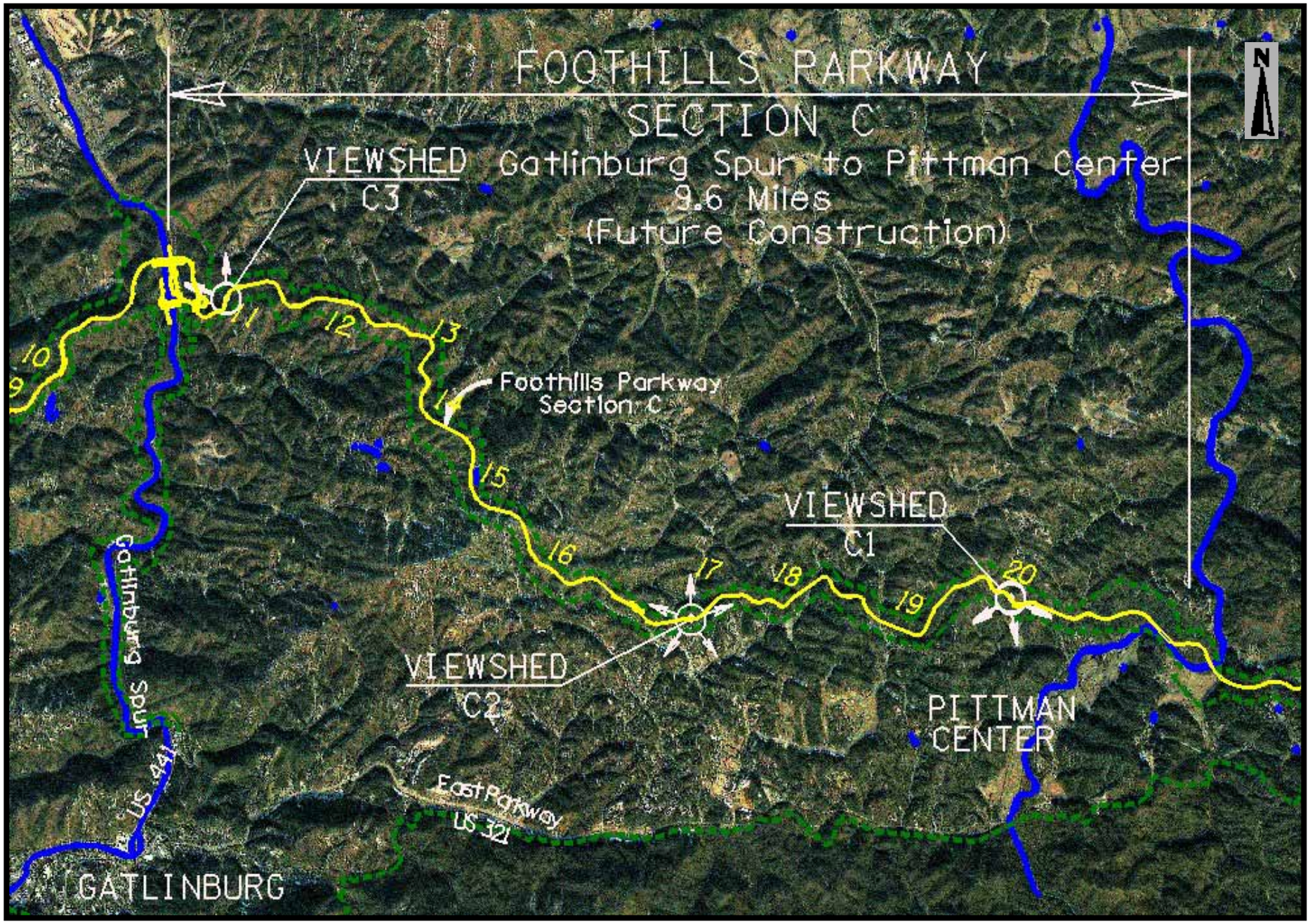


Figure 13. Foothills Parkway Section D

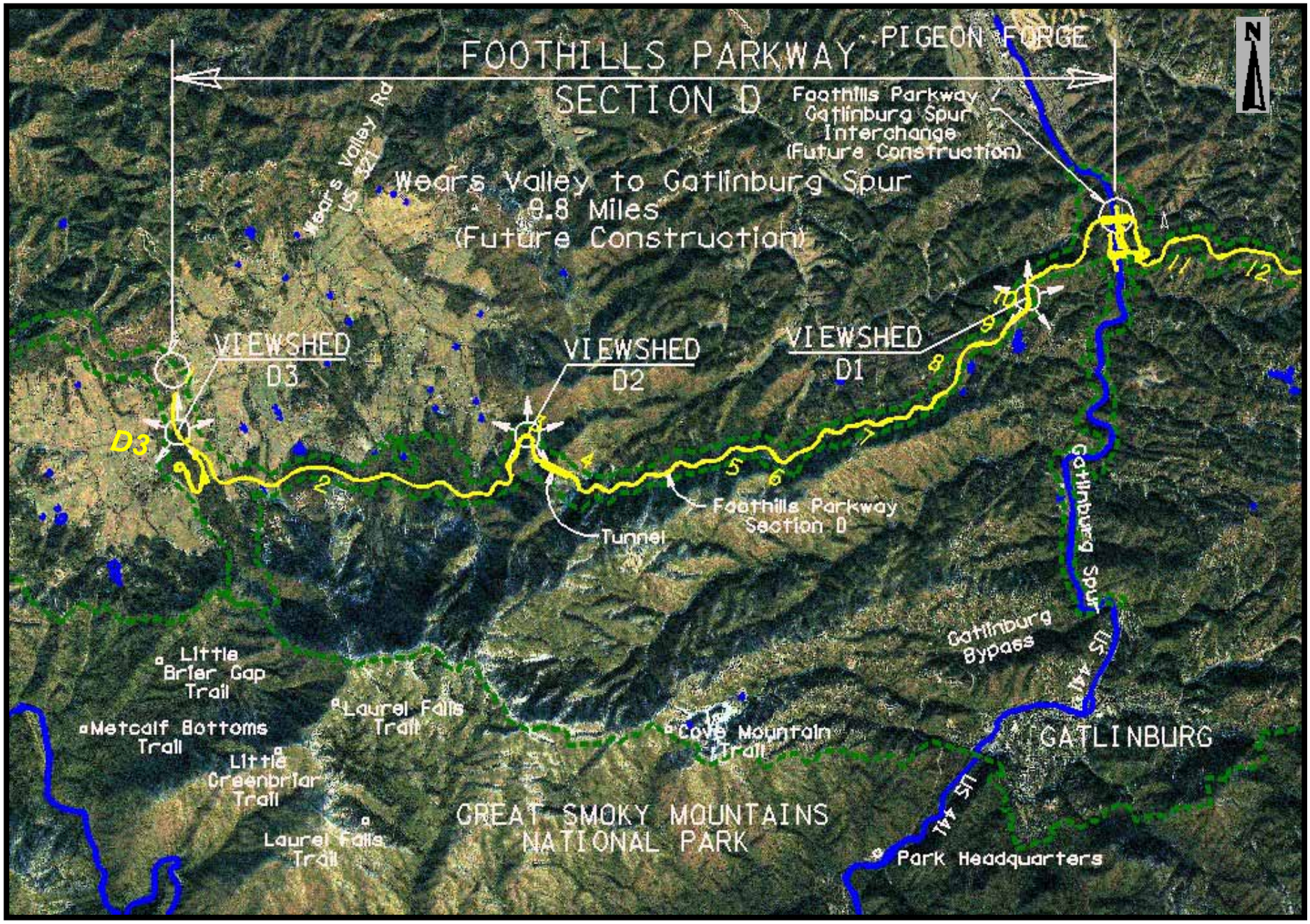


Table 2. Viewshed Attribute Evaluation

Parkway Section	Viewshed Designation	Location Range of Station No.		Viewshed Area (Acres)		Building Structures		Density (structures/acre)
				Inside GSMNP	Outside GSMNP	Inside GSMNP	Outside GSMNP	
B	21	1142 + 00	1146 + 00	422	810	0	9	0.01
	22	1184 + 00	1188 + 00	1,759	1,730	0	27	0.02
	23	1214 + 00	1218 + 00	3,070	1,230	0	42	0.03
	24	1229 + 00	1233 + 00	155	68	0	5	0.07
	25	1244 + 00	1248 + 00	2,060	132	0	13	0.10
	26	1285 + 00	1289 + 00	2,444	5,219	0	70	0.01
	27	1319 + 00	1323 + 00	3,194	213	0	22	0.10
	28 / 29 (B3)	1357 + 00	1361 + 00	2,926	1,248	0	6	0.00
	30	1417 + 00	1421 + 00	1,856	904	0	37	0.04
	31	1458 + 00	1462 + 00	2,401	3,859	0	123	0.03
	32	1496 + 00	1500 + 00	1,972	4,720	0	129	0.03
	33	1530 + 00	1534 + 00	4,068	477	0	17	0.04
	34	1565 + 00	1569 + 00	36	509	0	25	0.05
	35	1608 + 00	1612 + 00	4,387	370	0	17	0.05
	36 (B2)	1638 + 00	1642 + 00	1,289	840	0	112	0.13
	37	1655 + 00	1659 + 00	8,045	1,644	0	0	0.00
	38	1692 + 00	1696 + 00	3,734	1,923	0	0	0.00
	39	1740 + 00	1744 + 00	4,809	1,055	0	0	0.00
	40	1760 + 00	1764 + 00	98	1,439	0	22	0.02
	41 (B1)	1782 + 00	1786 + 00	35	1,557	0	58	0.04
	42	1798 + 00	1802 + 00	3,974	1,057	0	9	0.01
Subtotal				**30,474**	**10,871**	**0**	**260**	
C	11 (C3)	641 + 00	645 + 00	0	394	0	3	0.01
	12	686 + 00	690 + 00	0	212	0	21	0.10
	13	720 + 00	724 + 00	19	1,792	0	161	0.09
	14	742 + 00	746 + 00	0	2,590	0	211	0.08
	15	787 + 00	791 + 00	22	1,077	0	110	0.10
	16	823 + 00	827 + 00	2,388	640	0	11	0.02
	17 (C2)	878 + 00	882 + 00	767	449	0	29	0.06
	18	923 + 00	927 + 00	578	315	0	8	0.03
	19	976 + 00	980 + 00	448	252	0	12	0.05
	20 (C1)	1014 + 00	1018 + 00	805	376	0	4	0.01
Subtotal				**5,027**	**8,097**	**0**	**570**	
D	1	98 + 00	102 + 00	255	2,228	0	300	0.13
	43 (D3)	113 + 50	117 + 50	145	3,860	0	102	0.03
	2	184 + 00	188 + 00	43	3,049	0	207	0.07
	3 (D2)	290 + 00	294 + 00	0	1,285	0	87	0.07
	4	319 + 00	323 + 00	0	996	0	27	0.03
	5	389 + 00	393 + 00	0	589	0	9	0.02
	6	415 + 00	419 + 00	0	356	0	11	0.03
	7	457 + 00	461 + 00	0	971	0	12	0.01
	8	508 + 00	512 + 00	0	1,540	0	15	0.01
	9	532 + 00	536 + 00	0	1,398	0	21	0.02
	10 (D1)	548 + 00	552 + 00	0	1,493	0	12	0.01
Subtotal				**443**	**17,766**	**0**	**803**	
Total				**35,945**	**36,734**	**0**	**1,633**	

Table 3. Section B Viewshed Analysis

Viewshed Designation	Location Station No.		View Direction	Viewshed Typology	Viewshed Value	Average Viewshed Value	
						Park **	Total ***
21	1142 + 00	1146 + 00	0	3	3.96	3.96	3.96
			90R *	3	3.96		
22	1184 + 00	1188 + 00	0	3	3.96	3.96	3.96
			90R *	3	3.96		
			150R *	3	3.96		
23	1214 + 00	1218 + 00	0	1	3.19	3.96	3.70
			90R *	3	3.96		
			140R *	3	3.96		
24	1229 + 00	1233 + 00	0	3	3.96	3.96	3.96
			70L	3	3.96		
			120L	3	3.96		
			150R *	3	3.96		
25	1244 + 00	1248 + 00	0	1	3.19	3.96	3.70
			60R *	3	3.96		
			120R *	3	3.96		
26	1285 + 00	1289 + 00	0	1	3.19	3.96	3.58
			90R *	3	3.96		
27	1319 + 00	1323 + 00	0	3	3.96	3.96	3.96
			110R *	3	3.96		
28 (B3)	1328 + 00	1332 + 00	0	1	3.19	3.58	3.70
			60L	3	3.96		
			120L	3	3.96		
			180L	3	3.96		
			60R *	1	3.19		
			150R *	3	3.96		
29 (B3)	1357 + 00	1361 + 00	0 *	3	3.96	3.70	3.70
			60R *	3	3.96		
			120R *	1	3.19		
30	1417 + 00	1421 + 00	0 *	3	3.96	4.00	3.83
			90R *	1	3.19		
			120R *	3	3.96		
			180R	3	3.96		
			60L	3	3.96		
			90L	3	3.96		
31	1458 + 00	1462 + 00	0	5	4.61	4.61	4.61
			90R *	5	4.61		
32	1496 + 00	1500 + 00	0	5	4.61	4.61	4.61
			30R *	5	4.61		
			90R *	5	4.61		
			140R *	5	4.61		
33	1530 + 00	1534 + 00	0	3	3.96	3.96	3.96
			60R *	3	3.96		
			100R *	3	3.96		
			150R *	3	3.96		
34	1565 + 00	1569 + 00	0	1	3.19	3.19	3.36
			50L	2	3.61		
			90L	2	3.61		
			135L	1	3.19		
			150R *	1	3.19		
35	1608 + 00	1612 + 00	0	3	3.96	3.96	3.96
			60R *	3	3.96		
			120R *	3	3.96		
36 (B2)	1638 + 00	1642 + 00	0	3	3.96	3.92	3.81
			30L	3	3.96		
			130L	1	3.19		
			70R *	1	3.19		
			120R *	5	4.61		
			150R *	3	3.96		
37	1655 + 00	1659 + 00	0	1	3.19	3.96	3.70
			60R *	3	3.96		
			140R *	3	3.96		
38	1692 + 00	1696 + 00	0	3	3.96	3.96	3.96
			60L	3	3.96		
			120L *	3	3.96		
			60R	3	3.96		
			140R *	3	3.96		
39	1740 + 00	1744 + 00	0	1	3.19	3.96	3.58
			100R *	3	3.96		
40	1760 + 00	1764 + 00	0	1	3.19	3.19	3.19
			60L	1	3.19		
			90L	1	3.19		
			120L	1	3.19		
			180R *	1	3.19		
41 (B1)	1782 + 00	1786 + 00	0	3	3.96	4.61	4.29
			45R *	5	4.61		
			90R	5	4.61		
			135R	3	3.96		
42	1798 + 00	1802 + 00	60R	5	4.61	3.96	4.29
			90R	5	4.61		
			120R *	6	3.96		
			150R *	7	3.96		
Total						**86.89**	**85.37**

* Views inside the Park boundary.
** Includes only views inside the Park boundary.
*** Includes views both inside and outside the Park boundary.

Table 4. Section C Viewshed Analysis

Viewshed Designation	Location Station No.		View Direction	Viewshed Value	Average Viewshed Value	
					Park **	Total ***
11	641 + 00	645 + 00	0	3.19	0.00	3.56
			45L	3.96		
			90L	4.61		
			45R	3.19		
			90R	3.19		
			120R	3.19		
12	686 + 00	690 + 00	0	3.96	0.00	3.96
			30L	3.96		
			90L	3.96		
			150L	3.96		
13	720 + 00	724 + 00	0	3.19	3.19	3.19
			130R *	3.19		
			165R	3.19		
14	742 + 00	746 + 00	0	3.19	0.00	3.19
			60R	3.19		
			120R	3.19		
15	787 + 00	791 + 00	0	3.19	3.19	3.19
			30R	3.19		
			85R *	3.19		
			120R	3.19		
16	823 + 00	827 + 00	0 *	3.96	3.96	3.96
			30R *	3.96		
			90R *	3.96		
			150R *	3.96		
17 (C2)	878 + 00	882 + 00	0	3.96	3.73	3.75
			30L	3.96		
			90L	3.19		
			150L	3.96		
			60R *	3.96		
			90R *	3.61		
			150R *	3.61		
18	923 + 00	927 + 00	0	3.96	3.96	3.96
			45R *	3.96		
			90R *	3.96		
			150R *	3.96		
19	976 + 00	980 + 00	0	3.19	3.19	3.19
			60R *	3.19		
			90R *	3.19		
			150R	3.19		
20 (C1)	1014 + 00	1018 + 00	0	3.96	3.19	3.45
			30R	3.19		
			70R *	3.19		
			90R	3.19		
Total					**24.41**	**35.40**

* Views inside the Park boundary.
** Includes only views inside the Park boundary.
*** Includes views both inside and outside the Park boundary.

Table 5. Section D Viewshed Analysis

Viewshed Designation	Location Station No.		View Direction	Viewshed Value	Average Viewshed Value	
					Park **	Total ***
1	98 + 00	102 + 00	0	3.96	3.96	3.79
			45L	3.61		
			100L	3.61		
			20R *	3.96		
43 (D3)	113 + 50	117 + 50	0	3.19	3.79	3.83
			70L	4.12		
			120L	4.12		
			30R *	3.96		
			90R *	3.61		
			150R	3.96		
2	184 + 00	188 + 00	0	3.19	3.96	3.59
			70L	3.61		
			120L	3.61		
			170R *	3.96		
3 (D2)	290 + 00	294 + 00	0	3.19	0.00	3.19
			90L	3.19		
			150L	3.19		
			175L	3.19		
			150R	3.19		
4	319 + 00	323 + 00	0	3.19	0.00	3.58
			60L	3.96		
5	389 + 00	393 + 00	0	3.19	0.00	3.38
			60L	3.19		
			100L	3.19		
			150L	3.96		
6	415 + 00	419 + 00	0	3.19	0.00	3.45
			60L	3.96		
			90L	3.19		
7	457 + 00	461 + 00	0	3.19	0.00	3.77
			30L	3.96		
			90L	3.96		
			130L	3.96		
8	508 + 00	512 + 00	0	3.19	0.00	3.72
			20L	3.19		
			120L	3.96		
			60R	4.12		
			120R	4.12		
9	532 + 00	536 + 00	0	3.19	0.00	3.76
			50R	4.12		
			120R	4.12		
			170R	3.61		
10 (D1)	548 + 00	552 + 00	0	3.19	0.00	3.84
			90L	3.96		
			150L	3.96		
			90R	3.96		
			150R	4.12		
Total					**11.71**	**39.90**

* Views inside the Park boundary.
** Includes only views inside the Park boundary
*** Includes views both inside and outside the Park boundary.

Table 6a. Summary of Foothills Parkway Viewshed Analysis--Park View Only

Parkway Section	Section Length (miles)	Viewsheds Per Section	Viewsheds Per Mile	Park Viewshed Value	Viewshed Value Per Mile
B	14.10	22	1.56	86.89	6.16
C	9.60	7	0.73	24.41	2.54
D	9.80	3	0.31	11.71	1.19

Table 6b. Summary of Foothills Parkway Viewshed Analysis--Total View

Parkway Section	Section Length (miles)	Viewsheds Per Section	Viewsheds Per Mile	Total Viewshed Value	Viewshed Value Per Mile
B	14.10	22	1.56	85.37	6.05
C	9.60	10	1.04	35.40	3.69
D	9.80	11	1.12	39.90	4.07

2.4 Limitations

The viewshed preference values and sectional preference values determined in this report reflect the aesthetic quality of the viewshed under ideal conditions. Attributes such as development density and distance from the observation point to the target view were not used to discredit or credit the preference values. However, it is important to note that the current development as viewed from the digital satellite imagery within each viewshed area contained outside the Park is consistent with the land use projected in the 1968 *Foothills Parkway Master Plan*. The expectation of the typical Foothills Parkway user being consistent with the Blue Ridge Parkway user may not be valid, even though each parkway traverses similar topography and geography. Further study may be warranted to determine the affect of viewshed attributes on the preference values conducted only on the Foothills Parkway.

Traffic density also affects the visitor's ability to view the visual resources available along the Foothills Parkway. Pleasure driving and sightseeing are primary parkway visitor objectives that may be severely hindered by traffic congestion. The viewshed and sectional preference values do not take into consideration the affects traffic congestion may have on the parkway visitor. The next chapter addresses how traffic congestion affects the overall level of visitor experience.